[0018] The interactions via the touch screen is only recommended for a specific instruction such that successive direct operations are performed on GUI interface objects, such as successively applying functions of scrolling or zooming for viewing and zooming a map. If such an input operation is realized in a single gesture, the operation may be drastically simplified and burden on the user may be eased.

[0019] There are some suggestions regarding physical user interactions for realizing various tasks such as performing all of the computer operations by applying user's physical gestures on a portable computer. For example, the above-mentioned JP 11-143606 discloses a portable apparatus, which includes a feed back module for displaying information regarding data structure processed and a detector for detecting a user's manual operation, for modifying a display form of the data structure in response to the manual operation. The above-mentioned JP 07-64754 discloses a small information processing apparatus that can be held in single hand and make scrolling of a display in accordance with an inclination of the apparatus. In these apparatuses, interfaces are controlled by detecting user's actions applied on the apparatuses with sensors provided therein.

[0020] Rekimoto, J (Tilting operations for small screen interfaces; Proceedings of UIST'96. 1996. ACM. pp. 167-168) discloses a small display interface to be used for scrolling information display by detecting an inclination of an apparatus with a tilt sensor. However, these interfaces are focused on realization of only certain functionalities. In other words, the physical interactions to the computers are considered as asynchronous ones. If an action is performed, another user action would follow. No research has been made on an apparatus that can transparently combine and use a plurality of gestures.

[0021] Balakrishnan, R., G. Fitzmaurice, G. Kurtenbach, K. Singh (Exploring interactive curve and surface manipulation using a bend and twist sensitive input strip; Proceedings of Symposium on Interactive 3D graphics. 1999. ACM. pp. 111-118) and U.S. Pat. No. 5,396,265 disclose a flexible interface in which a rotation sensor is utilized to detect bending of sensing portions that are mechanically connected to each other. However, the disclosed interface focuses only to work of creating forms but not suggesting a general-purpose interface that can be applied to portable apparatuses or any other general apparatuses.

[0022] Further, there is physical interactions available for a desktop computer using a force detection device such as a space ball. However, applications of such physical interactions are limited to, in general, a navigation application in three-dimensional space.

[0023] With regard to the first aspect of the conventional input techniques, there are several attempts to investigate new types of interfaces and data input techniques suitable for mobile apparatuses. However, most of these investigations have been focused on a single task such as 3D data control (Balakrishnan, R., Fitzmaurice, G., Kurtenbach, G., Singh, K., "Exploring interactive curve and surface manipulation using a bend and twist sensitive input strip", Proceedings of Symposium on Interactive 3D graphics, 1999, ACM. pp. 111-118), or data scrolling (Rekimoto, J., "Tilting operations for small screen interfaces", Proceedings of UIST'96. 1996. ACM. pp. 167-168) or others (Fishkin, K., et al.,

"Embodied user interfaces for really direct manipulation", Communications of the ACM, 2000. 43(9): p. 74-80).

[0024] Furthermore, text input using conventional mobile or handheld devices are rather problematic in the following point. That is, input capabilities of mobile devices are usually limited to pen input and touch screens, buttons and jog-dials type of controllers. For text input, there are currently three widely used techniques: keyboard (on screen or as a physical array of buttons), number-pad input on mobile phones and gesture-based systems such as Palm Computing's Graffiti (product name). Of these, the number-pad text input technique may be the most widely used. However, such technique has some disadvantages since it requires multiple button presses for the input of each character.

[0025] All the above conventional techniques become more difficult to use as the size of the devices becomes smaller. The need for the physical buttons limits the miniaturization of portable computing devices. The touch screens are problematic on small devices because of their limited sensing resolution and because the user may occlude the screen during the input operation.

[0026] Furthermore, existing computer input devices such as mouse and pen interfaces allow various input operations, e.g. pressing button on the mouse or pressing pen on the tablet. However, external input devices are needed, which may be problematic in very small devices.

SUMMARY OF THE INVENTION

[0027] The present invention is conceived in view of the above described conventional user interface and data input techniques. It is desirable to provide data input and interface means for an apparatus where the user interacts with the apparatus by physically manipulating a body of the apparatus, and/or an apparatus including a visual display and such data input and interface means.

[0028] Furthermore, it is desirable to provide a graphic user interface means that enable a user to perform a range of tasks without using button, pen or any other mechanical controller, and/or an apparatus including a visual display and such graphic user interface means.

[0029] Furthermore, it is desirable to provide data input and interaction means for an apparatus including a two-dimensional position sensor and one-dimensional analogue sensor to detect user's operations to command the apparatus to perform tasks. In the present specification, the task refers to a particular mode of operation such as scrolling of image displayed on a screen, selecting a part of the displayed image and the like.

[0030] Furthermore, it is desirable to provide graphical user interface means for an apparatus including a two-dimensional position sensor and one-dimensional analogue sensor to input text or make selection from a menu/list.

[0031] According to an embodiment of the present invention, a user interface apparatus having a flexible part is provided. The user interface apparatus includes an analog sensor for sensing distortion of the flexible part, and means for detecting one of a plurality of first-type input states based on a value of the distortion sensed by the analogue sensor and having a task run, the task being related to a selected first-type input state. In the present embodiment, at least one